

AE306 HW-3

(Due: June 2nd, Thursday till 5 PM in lecture assistant's office.)

Q1) (30%) In low-speed flow, the pressure coefficient at a point on an airfoil is -0.9 . Calculate the value of C_p at the same point for $M_\infty = 0.6$ by means of

- a. The Prandtl-Glauert rule.
- b. Laitone's correction.
- c. The Karman-Tsien rule.

Q2) (70%) Consider a flat plate with a chord length (from leading to trailing edge) of 1 m. The free-stream flow properties are $M_1 = 3$, $p_1 = 1$ atm, and $T_1 = 270$ K. Using linearized theory, tabulate these properties as functions of angle of attack from 0 to 30° (use increments of 5°):

- a. Pressure on the top surface, P_2 .
- b. Pressure on the bottom surface, P_3 .
- c. Temperature on the top surface, T_2 .
- d. Temperature on the bottom surface, T_3 .
- e. Lift per unit span, L' .
- f. Drag per unit span, D' .
- g. Lift to Drag ratio.